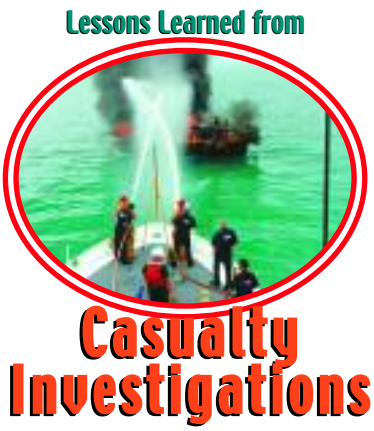

Sunk Within Seconds

The disappearance of a Great Lakes fishing vessel.

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On December 11, 1998, the fishing vessel *Linda E*, with her three crew members, set out of Port Washington, Wis., to retrieve and set gill nets. The winds were out of the southwest at approximately six knots, the sea was calm, visibility was seven miles and the air temperature was 31 degrees F. The nets they were retrieving were about nine miles southeast of the port. Ordinarily, the vessel would have returned to port between 1:00 and 3:00 p.m. the same day. At 8:00 p.m. the Coast Guard was notified that the vessel was overdue.

The Mystery
The Coast Guard immediately initiated a search that ultimately covered 3,000 square miles of the middle to lower western side of Lake Michigan. Searchers found no sign of the vessel, pollution, or debris. While the Coast Guard suspended its search approximately 48 hours later, local commercial salvors continued to look for the vessel.

The last contact with the vessel was at 9:45 the morning of the 11th. A representative of the owners of the vessel talked to a crew member on a cell phone. The vessel carried VHF radio, cellular telephone, radar, magnetic compass, autopilot, personal floatation devices, a ring buoy, buoyant apparatus, and exposure suits. Typical of Great Lakes commercial fishing boats, the vessel was fully enclosed with no watertight subdivisions. A main deck ran the length of the 42-ft-long vessel and a raised platform was at the wheelhouse. The steel hull was completely enclosed with a weather-tight steel superstructure. The superstructure was fitted with portholes along the port and starboard side of the main superstructure and in all directions in the wheelhouse. The portholes were the only means of seeing out of the wheelhouse. Four sliding metal doors, one aft, one amidships on the port side, and two forward were opened for the crew to work the gill nets. The forward doors were used to retrieve nets and the stern door was used to set nets.

The Investigation
On December 13, the Coast Guard began the investigation into the disappearance of the vessel. The Coast Guard looked at 26 commercial vessels that may have been in that portion of Lake Michigan on December 11 between 9:00 a.m. and 3:00 p.m. Investigators interviewed the crews of several vessels.

The investigators talked to family members, close friends and others familiar with the *Linda E*, to gather information on repair and maintenance history of the vessel. The Coast Guard also gathered information and conducted a stability test onboard a similarly constructed fishing vessel. This data was used to conduct a computer analysis to determine strength and stability characteristics of the lost vessel. The U.S. Coast Guard Marine Safety Center (MSC) determined that, based upon the most likely loading condition of the vessel at the time of its disappearance, the vessel met the stability criteria and severe wind and rolling criteria. The tests performed by the MSC determined that, even if the vessel had its bilges flooded, and an accumulation of ice upon its superstructure, the vessel still had substantial positive stability. The weather conditions on December 11 did not contribute to ice accumulation, and no vessel in the area reported icing on that day.

Because fishing vessels like the *Linda E* have no longitudinal watertight subdivisions, any breach of the watertight envelope would allow the vessel to sink. Calculations by MSC indicated that flooding through

an opening the size of the sliding doors would cause the vessel to sink within seconds, while flooding through an opening of 2.5 inches in diameter, such as that from a failed fitting, would take over an hour to sink the vessel.

An integrated tug, M/V *Michigan*, and barge, *Great Lakes* transited the waters off Port Washington between 11:30 a.m. and 12:05 p.m. on December 11, 1998. Of the 26 vessels investigated, this integrated tug and barge (ITB) combination was the only one in this area around this time. This ITB is 454 feet long and 60 feet wide. The barge was in a ballasted condition with drafts of 13 feet forward, 14 feet aft. When interviewed, the M/V *Michigan* crewmembers stated they did not see the *Linda E*, debris, or any other vessels in the area during their transit.

The mate relieved the master of the tug of the navigation watch at 11:30 a.m. The master stated he did not observe any vessel contacts on radar or visually while transiting the waters off Port Washington. The mate said the master passed no contacts to him. The radar on the *Michigan* was usually set for a six or 12 nautical mile range and neither the mate nor the master could recall what range the radar was set for during their watch.

When the *Michigan* is in the notch with the barge *Great Lakes* in ballast, the visibility of the operator in the pilothouse is restricted for some distance just forward of the barge. Even in this condition, the *Michigan/Great Lakes* met the visibility requirements of Title 33 CFR 164.15.

The portholes on the *Linda E* afforded limited visibility. There were blind spots, most notably the area caused by the exhaust stack forward and to the starboard of the wheelhouse.

Initial Conclusions

The *Linda E* sank off Port Washington. Three crewmen were missing at sea and presumed dead. The lack of a distress call and fact that no survival equipment was located indicated that the vessel sank quickly. Weather and sea state did not appear to be factors in this casualty.

Based on information gained at the last contact with the crew and the stability analyses performed, it was not likely that the vessel was overloaded or suffered from inadequate intact stability.

Had the *Linda E* carried an Electronic Position Indicating Radio Beacon (EPIRB), the Coast Guard might have been able to begin its search earlier and to condense the search area. Failure to maintain a continuous live watch at the main steering station increased the likelihood of collision.

There was no evidence that fatigue, drugs or alcohol contributed to this casualty. There was no evidence to support misconduct, negligence, inattention to duty, or willful violation of law or regulation on the part of any licensed or certificated persons. As a result of the preliminary investigation, it was recommended that the Commander, Ninth Coast Guard District examine the exemption policies for carriage of EPRIBs on all commercial fishing vessels operating on the Great Lakes. It was further recommended that MSO Milwaukee publish the results of this investigation as a safety advisory to all commercial vessels operating in Lake Michigan.

Discovery of the *Linda E*

For 18 months local commercial salvors' efforts to locate the *Linda E* were monitored by the Marine Safety Office Milwaukee. Despite hundreds of hours volunteered by these searchers, the location of the vessel remained unknown until the U.S. Navy Minesweeper *USS Defender* located it on June 18, 2000, when performing an underwater search.

Upon the discovery of the vessel, the Marine Safety Office Milwaukee reopened the investigation into the vessel's disappearance. The Captain of the Port

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Milwaukee placed a safety zone around the location of the *Linda E* to protect physical evidence at the wreck site. On June 21, 2000, the University of Michigan's remotely operated vehicle (ROV) was deployed from the U.S. Coast Guard Cutter *Acacia* to survey the wreck site. The ROV obtained video and still photography of the *Linda E* in its present condition. The ROV also collected paint samples from the vessel. These samples were sent to the Wisconsin State Crime Lab for comparison with samples collected previously from the barge *Great Lakes*.

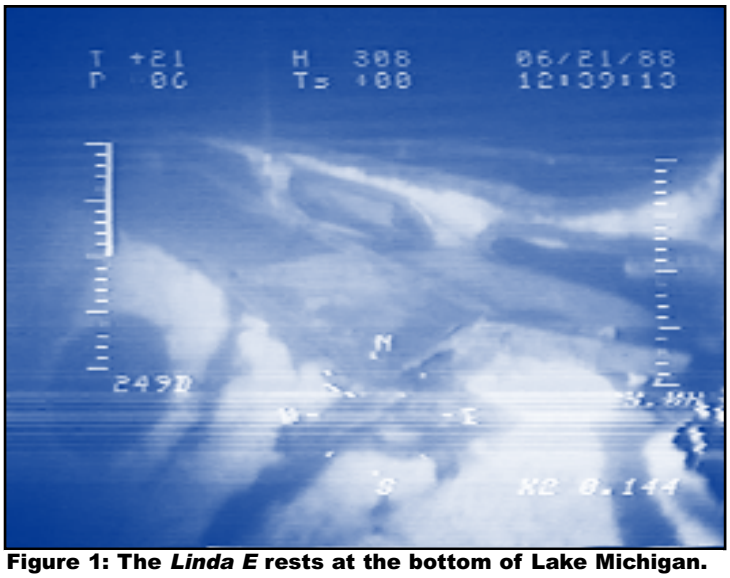


Figure 1: The *Linda E* rests at the bottom of Lake Michigan.

tom of Lake Michigan in 260 feet of water, upright, partially imbedded into the lake bottom with an approximate 20 degree heel to port (Figure 1). The vessel is 0.2 miles west of the northern gang of nets identified as being set by the crew. The closest point of land is the Wisconsin shoreline, seven miles to the west. The service door on the aft port side of the vessel was found open. A small tangle of fishing nets extended just outside this door. Two of the three stern doors on the vessel were found open. The door that slides open to the port side of the vessel was fully open. One of the two doors that slide open to the starboard side of the boat was fully open and the other was partially open. The spreader bar over which nets are normally set could be seen as could a small amount of nets through the stern door. All other doors on the vessel were closed (Figure 2).

Investigators analyzed the video and still photographs from the ROV to determine the cause of the casualty. Investigators developed a profile of the damage documented by the ROV and compared the geometry of several vessels with the *Linda E*'s damage profile. Comparing the information with photographs taken of the barge *Great Lakes* on December 22, 1998, investigators determined the location of white and black marks relative to the hull and to the vessel's December 11, 1998 waterline.

Figure 2: View of the starboard stern door.

Clues Emerge

The *Linda E* was found at the bot-

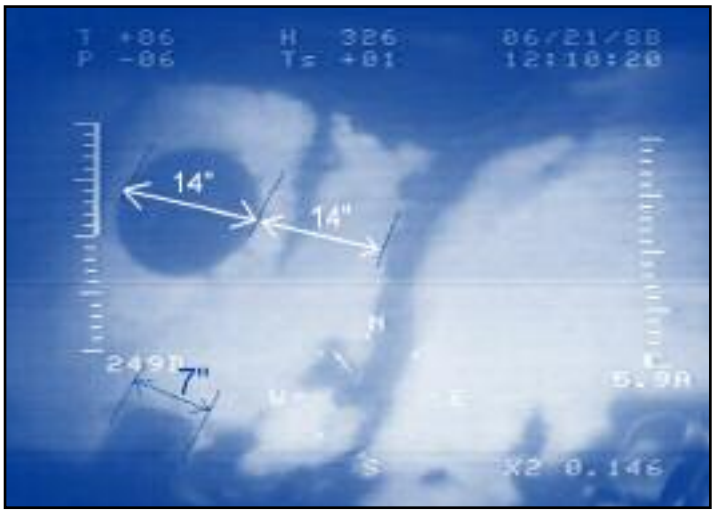


Figure 3: Damage to the vessel.

There was significant damage on the starboard quarter of the *Linda E*, along the side of the vessel from the forward end of the deckhouse aft, almost exclusively above the rub rail.

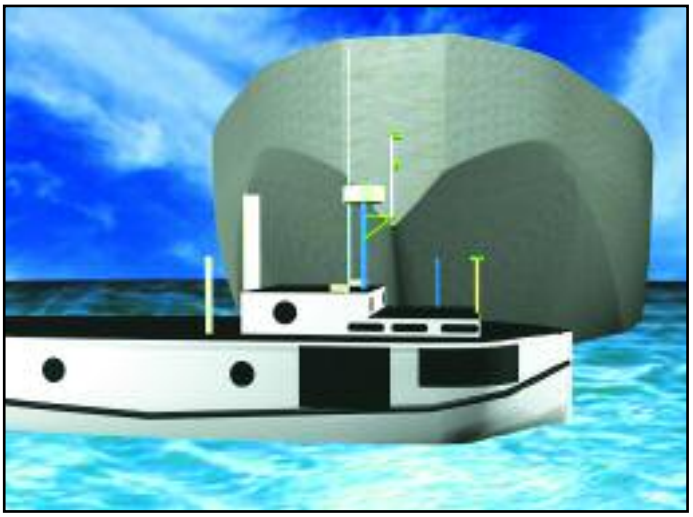
A wedge-shaped inset centered 14 inches forward of the aft, starboard portlight extended six feet vertically down from the top of the lower deckhouse to just below the rub rail (Figure 3). This inset was several feet wide near the upper deck and a few inches wide near the rub rail. The upper deck was crushed downward near the center of this inset. The deck was torn upward a few feet aft of the center of this inset.

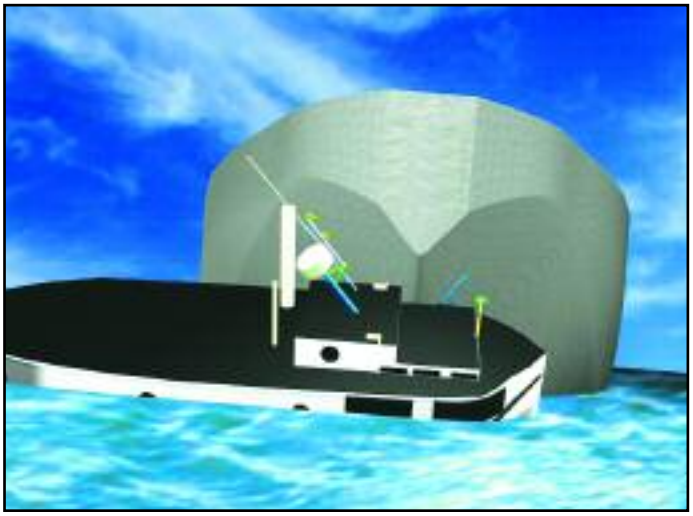
The aft starboard portlight had several fractures but

was not broken open. The lower deckhouse portlights on the starboard side were broken, their frames crushed. None of the other portlights on the vessel appeared to be damaged.

Appendages on the vessel were tilted in different directions. Those in front of the main inset bent forward and to port. Those behind the main inset are bent aft and to port. A number of appendages near the damaged area showed no visible signs of contact. There was no significant damage to the port side of the *Linda E*. Although the lake bottom obscured much of the bottom of the vessel, the visible portion of the hull beneath the rub rail showed little damage beyond a few superficial scratches. There appeared to be no significant damage to any other part of the vessel. There was no visible indication of fire on the vessel and no physical remains of the three missing crewmembers were found during the June 21, 2000 ROV dive.

The evidence suggests that the *Linda E* collided with the *Michigan/Great Lakes* barge. The MSC's comparison of the *Linda E*'s damage profile and the bow geometry of the barge determined that the most likely angle of heel that the *Linda E* would have experienced, had they collided, to be approximately 51 degrees to port. With a 51 degree angle of heel, the entire port side of the *Linda E* would have been submerged. If both the port service door and part of the stern door were open, the MSC estimated that it would take about two seconds to exceed the *Linda E*'s buoyancy and flood the vessel. This would explain the lack of distress signals or attempts to abandon ship.





Figures 4 and 5: Graphic analysis, illustrating how the accident may have taken place. Courtesy Marine Safety Center.

Evidence to support this conclusion includes the fact that the ITB was the only vessel in the area where the *Linda E* disappeared that day. The bow of the *Great Lakes* had markings consistent with those that could have come from contact with the *Linda E*. The bow geometry of the barge is consistent with the damage found on the *Linda E* and no other vessels known to be off Port Washington and Milwaukee on December 11, 1998 have that kind of bow geometry.

Contributing to the Casualty

Lack of visibility from both the ITB and the *Linda E* contributed to this collision and casualty. It is possible that the sun, just off the port bow of the ITB, was shining directly into the pilothouse and obscured the *Linda E*. Because of the length of the barge, once a small vessel such as the *Linda E* was close off the bow, the tug operator's view was obscured.

The window arrangement of the downed vessel, with widely spaced portholes, was not conducive to a wide view of surrounding waters. Having no one on watch in the pilothouse because of a policy of setting the boat on autopilot also contributed to the lack of visibility. The investigation concluded that the casualty was a collision between the ITB *Michigan/Great Lakes* and commercial fishing vessel *Linda E*.

The apparent cause is the failure of the operators of the tug to detect the *Linda E* and a failure of the operators of the *Linda E* to detect the ITB or take sufficient action to avoid collision with it. The operators of both vessels had radar to help reduce the risk of collision. The investigators concluded that the radar on the *Michigan*

was not monitored adequately or not used properly. The use of radar on the *Linda E* could not be determined.

It is possible that the crew aboard the ITB neither felt, heard, nor observed the collision with the *Linda E.*

Other contributing factors included the diverted attention of the ITB operator who was standing watch. The mate was performing a non-navigation activity that distracted his attention from activities essential to navigation—like looking out for other vessels.

Upon collision, the heel of the *Linda E* caused rapid downflooding through the submerged large door openings and overcame the vessel's reserve buoyancy, sinking the vessel within seconds.

The lack of watertight subdivision contributed to the rapid sinking, and prevented the crew from escaping. There was nothing to determine the vessel's operational status prior to the collision.

It is possible that the crew aboard the ITB neither felt, heard, nor observed the collision with the *Linda E* (Figures 4 and 5). Marks and damage to the barge suggested the collision was brief and light. Even if the collision were more severe, the resulting change in velocity of the barge would not have been detected by any crew members. Noise from generators and activity on the barge may have prevented hearing any sound of a collision and the *Linda E* most likely sank so quickly that it did not pass far enough aft to be seen by anyone on deck of the barge or in the pilothouse of the tug.

Lesson Learned/Recommendations

There was evidence the operators of the ITB failed to maintain a proper lookout to avoid a collision as required by Inland Navigation Rule 5. There was also evidence the operators failed to make proper use of the radar equipment to obtain early warning of risk of collision.

It could not be verified whether the *Linda E* crew maintained a lookout or used installed radar to avoid collision. However, the investigation did determine practices that indicated the crew may not have been standing a proper lookout prior to the collision. Location and investigation of the downed vessel did not alter any of the investigation's original conclusions concerning the effect of weather, sea state, fatigue, drugs, or alcohol on the outcome of this casualty.

Proper lookout procedures must not be influenced by distractions from normal watchstanding responsibilities, (such as updating charts or cleaning fish).

Final recommendations include:

- Promote the voluntary use of radars with anti-collision alarm features.
- Reiterate the inherent risks associated with operating a boat that has no watertight subdivision, including the difficulty of egress from a fast sinking fishing vessel.
- Re-emphasize to all Great Lakes fishing vessel operators the importance of properly displaying a fishing day shape.

The MSO Milwaukee published the contents of the supplemental report as a safety advisory to all commercial vessels operating in Lake Michigan. A copy of the report was provided to the state of Wisconsin and local agencies responsible for investigating boating accidents.

About the author: *Ms. Betty Lynn Sprinkle is a free-lance writer living in Alexandria, Va. In her 25 years of writing, she has covered such diverse topics as the construction industry, health care, higher education, and employment for national trade magazines, medical newsletters, university publications, and the* Washington Post.